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Wheat Streak Mosaic Virus and High Plains Virus

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Overview of WSMV and HPV

Wheat Streak Mosaic Virus

First discovered in Nebraska in 1922, wheat streak mosaic virus (WSMV) remains a threat today across most of the U.S. Central Plains. WSMV affects spring wheat, barley, corn, triticale, rye and numerous other annual and perennial grasses. Infected wheat plants normally are stunted, with leaves mottled and streaked in green-yellow, parallel and discontinuous patterns (Fig. 1). This disease's negative impact varies from year to year depending on its severity and distribution; in the Southern Great Plains states, crop losses due to WSMV exceed $30 million in some years but are insignificant in others.

High Plains Virus

High Plains Virus (HPV), occasionally called High Plains Disease, is a relatively new virus identified in the Great Plains in 1993. HPV usually occurs along with WSMV, because both are transmitted by the same vector, the wheat curl mite. Doubly-infected plants exhibit severe chlorosis, strong mosaic, severe stunting and rapid plant death. (See Fig. 2, 3 and 4.)

Wheat Curl Mite

The wheat curl mite is the sole vector transmitting WSMV and HPV from one plant to another. Levels of WSMV and HPV infection depend on the presence, reproduction and distribution of these mites.

Figure 1. Leaves infected with Wheat Streak Mosaic Virus. Picture from KSU Department of Plant Pathology web-site.

Figure 2. Wheat plant infected with Wheat Streak Mosaic Virus and High Plains Virus. Picture was provided by Dr. Charlie Rush, Plant Pathologist at TAMU–Amarillo.

Wheat curl mites are white, sausage-shaped mites with two pairs of legs at the front of their bodies. These mites are very small (1/100-inch long); 20x magnification (hand lens or microscope) is required to properly identify them (Fig. 5). Rolled or curled wheat leaves are characteristic symptoms of curl mite infestation; such leaves have an onion-leaf appearance. Although awns can become trapped in the tightly rolled leaf during heading, resulting in a reduced seed set, by itself the mite causes little to no economic damage to the wheat crop. However, when either WSMV or HPV or both are present, leaves become yellow-streaked and mottled, and severe economic loss may result.

Under favorable conditions, wheat curl mites have tremendous reproductive capability, enabling large populations to build. The mite is most active during warm weather, with temperatures of 75-80 degrees F optimum for reproduction. Mites require a living grass host to survive the summer; summer grasses and/or volunteer wheat provide a "green bridge" for the wheat curl mite to survive from one wheat crop to the next. Volunteer wheat is the most favorable host for the mite, as well as for WSMV and HPV, but native grasses and CRP land also can be important sources.

Mites migrate to new hosts when the original host begins to senesce. Because they crawl very slowly, the mites depend almost entirely on wind currents for dispersal. Consequently, most WSMV symptoms develop downwind from the grass hosts (volunteer wheat or other grasses), from southwest to northeast across a field.

Conditions favorable for the wheat curl mite include:

- Early and dense stands of volunteer wheat
- Volunteer wheat not destroyed prior to planting a wheat crop
- Early-planted wheat
- Cool summers with adequate moisture to sustain grasses throughout the season
- Warm, dry falls (optimum for reproduction)

Management of WSMV and HPV

There are no remedial control options once a wheat plant is infected with WSMV or HPV; therefore, preventing infection and/or planting resistant varieties are the most important control strategies.

Breaking the "green bridge" from one wheat crop to the next will prevent transmission of the viruses by wheat curl mites. You can destroy such "green bridges" by eliminating grass weeds and volunteer wheat within your fields and your neighbors' properties and by delaying plantings near CRP or native stands of grasses until after the first frost. Grass weeds

Figure 3. Wheat plant infected with Wheat Streak Mosaic Virus and High Plains Virus. Picture by Dr. Charlie Rush, Plant Pathologist at TAMU–Amarillo.

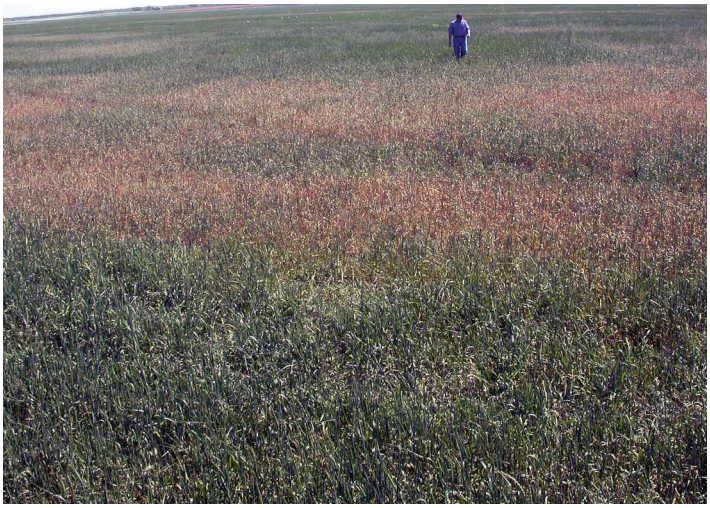

Figure 4. Wheat field infected with Wheat Streak Mosaic Virus and High Plains Virus. Picture by Dr. Gaylon Morgan, Texas Extension Small Grains Specialist.

and volunteer wheat should be destroyed 21 days prior to planting wheat by using tillage or a burn-down herbicide.

Current insecticide seed treatments do not control mites. Control with foliar insecticides is sporadic and may not be effective enough to reduce the risk of virus transmission. Additionally, wheat curl mites are difficult to identify by scouting until infestation levels are high or virus symptoms appear, making it too late for insecticide treatment.

Wheat varieties vary in susceptibility to WSMV; however, resistance levels seldom approach 50 percent. No wheat variety has enough WSMV resistance to endure high virus pressure. Plant a wheat variety with partial resistance to WSMV as part of an overall management plan, but only in combination with destruction of summer grasses and volunteer wheat. Currently, there is no known resistance to HPV in wheat.

Resources

Sources for the information in this publication included the following:

- *Managing Insect and Mites Pests of Small Grains*, Boring and Patrick, Texas Cooperative Extension. Available at http://insects.tamu.edu/extension/bulletins/b-1251.html
- *Wheat Curl Mite*, available at http://highplainsipm.org/HpIPMSearch/Docs/WheatCurlMite-SmallGrains.htm
- *Wheat Streak Mosaic Virus and the Wheat Curl Mite*, Townsend, Johnson & Hershman. University of Kentucky, College of Agriculture. Available at http://www.uky.edu/Agriculture/Entomology/entfacts/fldcrops/ef117.htm
- *Compendium of Wheat Diseases*, Wiese. American Phytopathological Society. 1987.

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